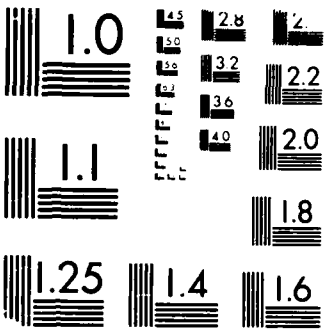
AD-A190 149 RESEARCH ON ALGEBRAIC MANIPULATION(U) MASSACHUSETTS INST OF TECH CAMBRIDGE J MOSES 15 APR 87 AFOSR-TR-87-2039 AFORR-85-0264 1/1

UNCLASSIFIED F/G 12/1 NL



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

SECURITY CLASSIFICATION OF THIS PAGE

(2)

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION: UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
AD-A190 149 (S)	5. MONITORING ORGANIZATION REPORT NUMBER(S): AFOSR-TR- 87-2039
6a. NAME OF PERFORMING ORGANIZATION: Massachusetts Inst of Tec	6b. OFFICE SYMBOL (If applicable):
6c. ADDRESS (City, State, and ZIP Code): Cambridge, MA	7a. NAME OF MONITORING ORGANIZATION: AFOSR/NM
	7b. ADDRESS (City, State, and ZIP Code): Bolling AFB, DC 20332
8a. NAME OF FUNDING/SPONSORING ORGANIZATION: AFOSR/NM	8b. OFFICE SYMBOL (If applicable): NM
8c. ADDRESS (City, State, and ZIP Code): Bolling AFB, DC 20332	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER: AFOSR-85-0264
	10. SOURCE OF FUNDING NUMBERS: PROGRAM ELEMENT NO 61102F; PROJECT NO 2304; TASK NO A7; WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)

Research On Algebraic Manipulation.

12. PERSONAL AUTHOR(S)
Joel Moses

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM 9/01/85 TO 8/31/86	87/04/15	2

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The focus of this research was algebraic manipulation or symbolic computation as in MACSYMA. The dilogarithm function was studied to obtain methods for the integraton of dilogs in closed form. The work points the way for a generalization of the concept of closed form solutions.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL: Abraham Waksman	22b. TELEPHONE (Include Area Code): (202) 767-5025 / 22c. OFFICE SYMBOL: AFOSR/NM

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

FINAL REPORT

TO THE

UNITED STATES AIR FORCE

ON

RESEARCH ON ALGEBRAIC MANIPULATION

GRANT AFOSR 85-0264

by

Joel Moses

Massachusetts Institute of Technology

April, 1987

Our major accomplishments relate to the dilogarithm function:

$$Li(x) = \int \frac{log(x)}{1-x}\, dx$$

The dilogarithm was thought to have hundreds and possibly and infinity of independent identities. We show that it only has two. One is similar to the logarithm identity and the other is similar to a special case of the exponential identity.

These identities vastly simplify the process of integration of dilogs in closed form. First, we demonstrate a generalization of Liouville's theorem, showing the relationship of dilogs in the integral to that in the integrand. Second, we generalize all cases but the algebraic one for Risch's integration algorithm when dilogs can exist in both the integrand and integral.

The dilogarithm is the first truly nontrivial special function that has been analyzed to this extent. This work points the way for a generalization of the concept of "closed form." Such a generalization may increase the value of algebraic manipulation techniques to a broader class of problems.

This work was turned done largely by my graduate student Jamil Baddoura.

END
DATE
FILMED
5-88
DTIC